# A MONOGRAPHIC STUDY OF THE WEST INDIAN SPECIES OF PHYLLANTHUS* 

Grady L. Webster

With three plates
Subgenus IV. Phyllanthus.
Herbs or undershrubs with phyllanthoid branching and relatively small leaves. Monoecious or dioecious; female flowers solitary, male flowers solitary or in axillary cymules. Male flower: calyx-lobes 5 or 6 ; disk of 5 or 6 segments; stamens 2 or 3, free or united; anthers dehiscing vertically to horizontally; pollen grains various. Female flower: calyx-lobes 5 or 6 ; disk cupuliform or divided into 5 or more segments; ovary of 3 carpels, smooth or roughened; styles bifid, mostly free. Fruit capsular. often explosively dehiscent; seeds trigonous, 2 in each locule, mostly ribbed or verruculose.

This subgenus, as here defined, comprises a part of sections Paraphyllanthus and Euphyllanthus sensu Mueller, and includes the majority of the herbaceous species in the genus. It is certainly a heterogeneous group and possibly a polyphyletic one, the various herbaceous representatives perhaps having evolved from different shrubby ancestors; but in the absence of any pertinent evidence to the contrary, the following four West Indian sections seem best grouped together.

It must be admitted that the demarcation of this, the typical subgenus, is the most unsatisfactory of any of the subgeneric divisions of Phyllanthus. At present it is most difficult to decide whether a number of puzzling Old World groups, such as the Indo-Chinese species of sections Emblica and Paraphyllanthus (sensu Beille, Fl. Gen. Indo-Ch. 5: 572-573. 1927), should be included or not. These plants, being mostly trees and shrubs, do not clearly fit into subg. Phyllanthus, but there does not appear to be any other very satisfactory place to put them. In the West Indies, however, members of subg. Phyllanthus can be easily recognized by their herbaceous habit and reduced male flowers.

## KEY TO THE SECTIONS

1. Ovary smooth or papillose; seeds mostly verruculose or longitudinally ribbed, never transversely ribbed or foveolate; leaf-blades never hispidulous (margins crenulate in sect. Callitrichoides).
2. Disk or calyx purplish-tinged, or else ovary papillose; flowers entirely solitary; pollen grains not colporate.
3. Stamens connate by the filaments but anthers free; leaves crisply succulent; pollen grains banded
4. Callitrichoides

* Continued from volume XXVIII, p. 80.

3. Stamens completely connate into a circumscissile synandrium; leaves not succulent; pollen grains foveolate
4. Cyclanthera
5. Disk or calyx never purplish, sometimes reddish-tinged; ovary smooth; male flowers not solitary (except in $P$. mimicus, which has free stamens); pollen grains colporate
6. Phyllanthus
7. Ovary bullate-rugose; seeds transversely ribbed and often foveolate on the sides; leaf-blades hispidulous beneath near the margins . . . . . . . . . . . . . . . . . . . . . . . . . . . . 10. Urinaria

Sect. 8. Callitrichoides Webster, Contr. Gray Herb. 176: 51. 1955.
Small herbs with the habit of species of Callitriche and Peperomia, tissues crisp-succulent; branching phyllanthoid, the primary axis short, bearing crowded, spreading branchlets, these often rooting at the nodes; leaves of branchlets distichous, with crenate-cartilaginous margins. Monoecious; flowers solitary, most branchlets with $1-4$ male flowers and a single distal female flower near the tip. Male flower: calyx-lobes 5, obovate, acute; disk-segments 5, reniform, purplish; stamens 2, filaments completely united, anthers discrete but sessile atop the column, dehiscing horizontally; pollen grains spheroidal, appearing banded due to the transversely elongated areoles. ${ }^{13}$ Female flower: calyx-lobes 6, oblong or spathulate; disk-segments 6, narrowly cuneate, purplish; ovary densely scabridulous; styles ascending, emarginate or bifid. Capsule small, densely scabridulous; seeds brownish, verruculose with scattered dark points.

Type species: Phyllanthus carnosulus Muell. Arg.
The type species, a rare plant endemic to eastern Cuba, is the sole representative of this interesting monotypic section. Its unique habit at once distinguishes it from all its North American congeners. Although Mueller placed it in the alliance of $P$. heliotropus, $P$. hyssopifolioides, et al. (now in sect. Loxopodium), it is not at all closely related to these. Its nearest affinity is undoubtedly with the species of sect. Cyclanthera, which (as pointed out below) have either been derived from sect. Callitrichoides or from some common ancestor.

Although there can be little doubt that sects. Callitrichoides and Cyclanthera are closely allied (so closely, in fact, that the two could perhaps be treated as subsections of a common section), it is not at all clear from what other group in the genus these two highly specialized sections might have been derived. The ancestral group certainly was not any of the taxa in sect. Phyllanthus, none of which shows a close relationship. The peculiar pollen of sect. Callitrichoides is found nowhere else in the genus and has a counterpart only in Andrachne brittonii. The latter also has very small somewhat succulent leaves; but it differs in many important details, such as its woody xerophytic habit with spiny branch-tips and its petaliferous flowers, so that its resemblance to $P$. carnosulus must be ascribed to an interesting case of parallelism.

[^0]Perhaps sect. Loxopodium comes closest to being a likely progenitor, so that Mueller's placement of $P$. carnosulus among the species of that group was not entirely without merit. The leaves and stipules of sect. Callitrichoides are certainly similar to those of various representatives of Loxopodium, and the free cuneate disk-segments of the female flower - as well as several other floral details - are suggestively alike in both groups. However, to suggest that sect. Callitrichoides did evolve from some representative of sect. Loxopodium involves the assumption that the phyllanthoid branching of this section has evolved independently of that in sect. Phyllanthus. Since a similar assumption appears necessary in the case of sect. Urinaria, it thus is quite possible that phyllanthoid branching has originated independently three times within subg. Phyllanthus.
11. Phyllanthus carnosulus Muell. Arg. Linnaea 32: 30. 1863; DC. Prodr. 15(2): 388. 1866.
(PLATE XVI, figs. $A-E)$.
Diasperus carnosulus (Muell. Arg.) O. Ktze. Rev. Gen. 2: 598. 1891.
Phyllanthus haplocladus Urb. Repert. Sp. Nov. 28: 214. 1930.
Low perennial herb with crisply and slightly succulent branches and leaves, the habit like that of a small Peperomia or Pilea; primary axis becoming a slender dark brown rootstock $\mathrm{c} .0 .5-1 \mathrm{~cm}$. long and $1.5-4 \mathrm{~mm}$. thick, bearing stubs of old branches below. Cataphylls scarious, brownish; stipules triangular-ovate, denticulate or lacerate towards the acute or acuminate tip, up to 0.8 mm . long and 0.6 mm . broad; blade narrower. Deciduous branchlets crowded at apex of rootstock, spreading or prostrate, sometimes rooting at the nodes, (3-) $5-8(-15) \mathrm{cm}$. long, 0.2-0.6 mm . thick, stramineous, minutely papillate-scabridulous, angled, furrowed when dried, with c. (10-) 25-40 (-50) leaves; first internode usually 1 cm . long or more, median internodes mostly $1-3.5(-6) \mathrm{mm}$. long. Leaves: stipules ovate-triangular to lanceolate, acute or acuminate, somewhat dilated at the basal corners but not distinctly auriculate, denticulate or nearly entire, at first thin and olivaceous or reddish-tinged, at length firmer, the midrib dark brownish, the margins scarious, $0.5-0.9 \mathrm{~mm}$. long, 0.3-0.6 ( -0.7 ) mm . broad. Petioles $0.2-0.4 \mathrm{~mm}$. long, flattened, smooth. Blade obovate to elliptic or oblong, rounded or obtuse and apiculate at the tip, acute to obtuse at the base, (2-) 3.5-6 (-7) mm. long, $1.5-4 \mathrm{~mm}$. broad; above olivaceous, rugulose-reticulate, the midrib, laterals and anastomosing tertiary veinlets slightly raised; beneath pallid, dull reddish, obscurely scabridulous, the midrib prominent but second-

## PLATE XVI. Sections Callitrichoides and Cyclanthera.

Figs. A-E. Phyllanthus carnosulus Muell. Arg. A. habit (Ekman 16090 [S]); B, male flower; C, androecium seen from one side (left) and facing an anther (right) ; D, leaf; E, female flower with three calyx-lobes removed (Wright " 714 " [GOET]).

Figs. F-H. Phyllanthus tenuicaulis Muell. Arg. (Wright 1675). F, male flower; G, androecium and disk seen from the side; H, female flower. (Figs. $\mathrm{B}-\mathrm{H}$ drawn to the same scale.)


Webster, West Indian Phyllanthus
ary veins obscure; margin usually unevenly cartilaginous-thickened, or more less regularly cartilaginous-toothed beyond the middle.

Monoecious, but male flowers readily deciduous and specimens thus sometimes appearing entirely female. Flowers strictly solitary in the distal axils of the branchlet; most often the males 2-4 on a branchlet and the single female flower distal to them (but female flower sometimes proximal).

Male flower: pedicel capillary, mostly $2.5-5 \mathrm{~mm}$. long. Calyx-lobes 5 , narrowly elliptic to obovate, c. $0.7-0.8 \mathrm{~mm}$. long, $0.4-0.5 \mathrm{~mm}$. broad, acute, entire or obscurely denticulate, membranous, yellowish with a scarious margin, thin, the midrib somewhat raised without but plane within, unbranched. Disk-segments 5 , more or less reniform, с. $0.25-0.35$ mm . broad and $0.15-0.2 \mathrm{~mm}$. long, distinctly purple, subentire, smooth and not evidently pitted. Stamens 2 ; filaments completed fused into a column c. $0.2-0.3 \mathrm{~mm}$. high; anthers sessile atop the column and contiguous but discrete, $0.25-0.3 \mathrm{~mm}$. broad, dehiscing horizontally, the anther-sacs not confluent; pollen grains spherical, c. $15 \mu$ in diameter, banded by ribbon-shaped areoles.

Female flower: pedicel straight, terete, smooth, c. $1-1.7 \mathrm{~mm}$. long. Calyx-lobes 6, narrowly oblong to spathulate, $0.8-0.9 \mathrm{~mm}$. increasing to $1-1.4 \mathrm{~mm}$. long, $0.35-0.7 \mathrm{~mm}$. broad, acute or obtuse, olivaceous with scarious margins; midrib slightly raised without and (at the base) within, unbranched. Disk-segments 6, completely separate, c. $0.2-0.25 \mathrm{~mm}$. long, cuneate (often narrowly so) from a stipitate base, expanded to a truncate, emarginate, or bifurcate tip, distinctly purplish, subcarnose, smooth and entire. Ovary oblate, c. 0.3 mm . high and twice as broad, densely but minutely papillate-scabridulous. Styles free, erect or ascending, c. 0.3 mm . long, emarginate to shortly bifid, slender, the tips spreading to recurved.

Capsule c. 1.5 mm . in diameter when mature, breaking up readily, the thin valves yellowish brown, scurfy-roughened, not nervose. Seeds $0.7-$ 0.75 mm . long, $0.55-0.6 \mathrm{~mm}$. radially, $0.6-0.7 \mathrm{~mm}$. tangentially, fuscous, plumply trigonous, granulate with evenly spaced raised dark points.

Map IV. Distribution of Phyllanthus carnosulus Muell. Arg. (open circles) and Phyllai:thus tenuicaulis Muell. Arg. (solid circles).

Map V. Distribution of certain taxonomic characters among the populations of Phyllanthus lindenianus Baill. Open circles indicate plants completely smooth; scabridulosity is indicated by blackening portions of circles as follows: southeast quadrant, female pedicel ; southwest quadrant, stem; northwest quadrant, female calyx; northeast quadrant, leaf. Erect bar indicates presence of iterative axes on branchlets (at least in part); oblique bar signifies marked inequality of leaf size; horizontal bar denotes perennial habit.

Map VI. Distribution of the varieties recognized within Phyllanthus lindenianus: var. inaequifolius, open circles; var. jimenezii, square; var. leonardorum, stars; var. lindenianus, solid circles.


Type: "Cuba orientali," Wright 591 (G, holotype). According to the data associated with the isotype specimen in the New York Botanical Garden Herbarium, this number was collected at Monte Toro. In the packet of the Gray Herbarium sheet on which Wright 591 is mounted are three labels with the localities: "La Luisa in Monte Toro," "Potosí Mt. Liban," and "Potosí Monte Toro"; however, it is not clear whether these belong with no. 591 or with Wright 1939, which is also mounted on the sheet.

Distribution: endemic to the mountainous parts of Oriente Province, Cuba (MAP IV).

CUBA. Oriente: Sierra Maestra, southeast of Bayamo, in the rocky shrub forest at the base of an enormous stone ("El diente del Gigante"), on top of Loma del Gigante, alt. c. 1200 m., Ekman 16090 (NY, S; type collection of P. haplocladus). "Cuba orientali" [i.e., Sagua-Baracoa range], Wright 591 (G, HoLotype; BR, GH, NY, isotypes), 1939 (G, GH, GOET, MO, S, W), " 530 ", " 714 ", (GOET, these being field numbers and presumably corresponding to either 591 or 1939).

This remarkable little plant, though apparently quite rare, may be encountered by future collectors in the wetter parts of both the Sierra Maestra and the Sagua-Baracoa range. On his manuscript notes quoted above, Wright gave the habitat data for the species as "base of cliffs," "margins of mountain-rivulets," and "dense woods," respectively. The habit of the plant leaves no doubt that it is quite hydrophilic, and from the debris clinging to the specimens one can infer that it grows in rain-forest areas on marly banks, often associated with mosses and liverworts. Dr. Howard Crum kindly identified the moss associated with Ekman 16090 as Phyllogonium fulgens, and the two with Wright 591 and " 714 " as Trichostomum jamaicense and Thuidium urceolatum, respectively.

As far as can be judged from examination of the relatively few collections, $P$. carnosulus is a rather homogeneous species. Although there is some variation in length and number of leaves per branchlet, as well as in other respects, there is no evidence that the Sierra Maestra population deserves any special subspecific designation. Urban, in fact, appears to have overlooked the fact that Mueller had already described the species, for when proposing $P$. haplocladus as a new species he said nothing about its relationships. Urban's description is misleading in that he reported the plant to be annual and probably dioecious. However, several of the plants of the type collection (Ekman 16090) are obviously more than one year old; evidently the species is a perennial which may flower the first year. Nor is it likely that plants of $P$. carnosulus are ever dioecious; but the male flowers are readily deciduous, so that older specimens sometimes give the appearance of bearing only female flowers.

The slightly succulent leaves with cartilaginous "toothing," the adventitious roots, the solitary flowers with purplish disk-segments (described as "dark red" in the living condition by Wright), and the unique pollen grains distinguish $P$. carnosulus from all its congeners. However,
it is clearly more closely related to $P$. tenuicaulis of the following section than to any other species; the two plants show a near affinity through the common possession of a very small papillose capsule, in addition to the several characters that the other species of sect. Cyclanthera share with $P$. carnosulus. It appears reasonable to conclude, therefore, that the species of sect. Cyclanthera have been derived from sect. Callitrichoides via $P$. tenuicaulis or some very similar form.

Sect. 9. Cyllanthera Webster, Contr. Gray Herb. 176: 47. 1955.
Annual or perennial herbs or low subshrubs, with phyllanthoid branching; deciduous branchlets often with a smaller iterative axis ${ }^{14}$ from the first node, and leaves of upper branchlets often much smaller than those below. Monoecious or dioecious; flowers entirely solitary, in axils on both axes of branchlet. Male flower: calyx-lobes 5 or 6 ; disk-segments 5 or 6, purplish; stamens 3, filaments connate into a column, anthers completely coalescent into a disciform circumscissile synandrium; pollen grains globose, foveolate. ${ }^{15}$ Female flower: calyx-lobes 6; disk of 3-8 lobes, usually purplish; ovary smooth or scabridulous; styles bifid, free or united. Capsule smooth or scabridulous; seeds verruculose.

Type species: Phyllanthus lindenianus Baill.
This very distinctive section of eight specific and subspecific taxa is endemic to Cuba and Hispaniola. As pointed out in the original description, the section is strongly characterized by the remarkable modification of the androecium, the unique pollen grains somewhat resembling those of Polygonum sect. Persicaria, and the common production of an extra ("iterative") leafy axis from the first node of the deciduous branchlet. The only clearly related group, sect. Callitrichoides, is believed to be ancestral to the present section because of its less specialized androecium. If this is correct, then the "foveolate" ornamentation of the pollen grains of Cyclanthera has presumably been derived through modification of the "banded" pollen grain of Callitrichoides (cf. Plate IX, figs. 39 and 40).

The vegetative peculiarities of sections Callitrichoides and Cyclanthera are of particular interest in considerations of both phylogeny and the origin of phyllanthoid branching. In sects. Urinaria and Phyllanthus the branchlets produce at the nodes only flowers or floral axes; but in sect. Callitrichoides roots can be formed at branchlet nodes, and in sect. Cyclanthera all of the species except $P$. berteroanus produce a second leafy axis (iterative branchlet) from the first node of each branchlet. Furthermore, in sect. Cyclanthera the leaves of the upper part of the stem are often strikingly smaller than those of the lower part. These specializations provide evidence favorable to the hypothesis that phyllanthoid branching has originated independently in three different lines within subg. Phyllanthus.

[^1]From a phytogeographic point of view, sect. Cyclanthera is noteworthy in having its center of distribution in Hispaniola. Of the eight named taxa of the section, seven occur in Hispaniola and six are endemic there, while only two taxa are found in Cuba, and only the typical variety of $P$. tenuicaulis is endemic there. However, when one considers the origin of the section, Cuba assumes a relatively more important position, since the ancestral sect. Callitrichoides is confined to Oriente Province. Perhaps the origin of sect. Cyclanthera may be referred to that period in the Cenozoic when eastern Cuba and Hispaniola formed a single landmass.

The following treatment of the eight constituent taxa of sect. Cyclanthera must be considered only provisional, and the lack of field observations is keenly felt. A satisfactory treatment does not appear possible until further collecting is done and the possibility of hybridization taken into account.

## KEY TO THE SPECIES

1. Leaves of main axis not reduced to cataphylls except at uppermost nodes, mostly coriaceous; deciduous branchlets never with iterative axes; disk-segments petaloid, extending far outside the margins of the synandrium ; pedicel of female flower mostly $6-10 \mathrm{~mm}$. long or more; seeds $1.8-2.3 \mathrm{~mm}$. long; northern Hispaniola
2. $P$. berteroanus
3. Leaves of main axis reduced to cataphylls; deciduous branchlets often with iterative axes; disk-segments inconspicuous, not projecting far beyond the synandrium; pedicel of femaie flower 5 mm . long or less; seeds not over 1.4 mm . long.
4. Capsule minutely scabridulous, c. 1.5 mm . in diameter; calyces greenish white or purplish only at the base; slender annual with nearly smooth, greenish (never purplish) branchlets; Cuba and northern Haiti
5. P. temuicaulis
6. Capsule smooth, 2 mm . or more in diameter; calyces usually purplish-stained.
7.     - Synandrium subsessile, the column less than 0.3 mm . high; calyx-lobes of male flower free to the base; styles free; habit various; Cuba and Hispaniola
8. P. lindenianus
9. Column of synandrium c. 0.7 mm . high; calyxlobes of male flower united into a turbinate cup; styles united into a column $0.15-0.2 \mathrm{~mm}$. high; subshrub with clustered stems and membranous leaves; southwestern Haiti
10. P. abditus
11. Phyllanthus tenuicaulis Muell. Arg. Linnaea 32: 44. 1863; DC. Prodr. 15(2): 409. 1866, (PLATE XVI, figs. $F-H$ ).

Diasperus tenuicaulis (Muell. Arg.) O. Ktze. Rev. Gen. 2: 601. 1891.

A very slender herb with an erect simple or sparingly branched stem $1-3 \mathrm{dm}$. high, 1 mm . thick or less, stramineous or greenish, terete, nearly smooth. Cataphylls thin and scarious, greenish white with an olivaceous tinge; stipules lanceolate, acute or acuminate, more or less obliquely attached but not auriculate, entire, $0.4-0.6 \mathrm{~mm}$. long, $0.2-0.3 \mathrm{~mm}$. broad; blade linear-lanceolate, entire, $0.4-0.7 \mathrm{~mm}$. long, c. 0.15 mm . broad. Permanent branches mostly suppressed. Deciduous branchlets simple or producing an iterative axis from the first node, $1-3.5 \mathrm{~cm}$. long, $0.1-0.2 \mathrm{~mm}$. thick, stramineous, smooth or very obscurely scabridulous proximally, terete or somewhat angled, with 7-20 leaves; first internode 3-7 (-9) mm. long, median ones c. 1.5-3 (-4) mm. long. Leaves: stipules ovate to lanceolate, $0.4-0.5 \mathrm{~mm}$. long, $0.2-0.25 \mathrm{~mm}$. broad, acuminate, truncate at the base, entire, olivaceous with pale scarious margins. Petioles smooth, $0.3-0.5 \mathrm{~mm}$. long. Leaf-blades membranous, obovate to elliptic or suborbicular, (3-) 4-8 (-11) mm. long, (1.5-) 2-4 mm. broad, mostly subtruncate or rounded and apiculate at the tip, acute at the base; above deep green, the nerves rather obscure; beneath pruinose, smooth or appearing roughened when young, the midrib slightly raised, the laterals obscure or visible and anastomosing; margin not thickened, smooth or sometimes crinkled.

Monoecious; flowers solitary, branchlets often with 1 to 2 female flowers toward the tip, the male flowers proximal or sometimes also distal to them; sometimes male and female flowers apparently on separate branchlets (due to the fugaciousness of the male flowers).

Male flower: pedicel capillary, $1.7-3.3 \mathrm{~mm}$. long. Calyx-lobes 5 (rarely $6)$, ovate or triangular, $0.5-0.9 \mathrm{~mm}$. long, $0.3-0.8 \mathrm{~mm}$. broad, sharply acute, entire, thin, scarious-hyaline, entirely yellowish white or sometimes purplish-blotched at the base (never with purplish midrib or scattered flecks). Disk-segments 5 , cuneate, c. $0.2-0.25 \mathrm{~mm}$. broad, with a rather fleshy fold at the base but thin and subpetaloid distally, more or less hidden under the nearly sessile synandrium. Synandrium disciform, 0.3 mm . broad across the connective; pollen grains c. 13-14 $\mu$ in diameter.

Female flower: pedicel slender, straight or slightly curved, smooth, olivaceous, $1-2.2 \mathrm{~mm}$. long. Calyx-lobes 6 , elliptic to ovate, $0.9-1 \mathrm{~mm}$. long, $0.45-0.6 \mathrm{~mm}$. broad, acute, entire, olivaceous with broad yellowish white scarious margins, sometimes purple-blotched at the base (never purple-flecked all over). Disk-segments 6, thin, hyaline, c. 0.25 mm . long, cuneate, smooth, entire. Ovary closely and minutely scabridulous. Styles free, horizontally spreading, $0.15-0.2 \mathrm{~mm}$. long, bifid or c. $2 / 3$-parted, the branches spreading, the unthickened tips recurved.

Capsule scabridulous, c. 1.5 mm . in diameter, the valves thin, stramineous, nervation obscure. Seeds [all those observed immature] c. 0.75 mm . long, 0.5 mm . radially, marked with dark raised points.

The species comprises two vicarious populations, one Cuban and one Haitian, which differ in the characters mentioned in the following synopsis:

11a. Phyllanthus tenuicaulis var. tenuicaulis.
Deciduous branchlets c. $1-3.5 \mathrm{~cm}$. long, with $7-11$ leaves; leaves obovate, (3-) 4-7 (-11) mm. long; calyx-lobes of male flower 0.5-0.7 mm . long; pedicel of female flower c. $1-1.2 \mathrm{~mm}$. long.

Type: "Cuba Orientali," Wright 1675 ex $p$.
Distribution: endemic to eastern Cuba (Map IV).
CUBA. Oriente: Sierra Maestra. La Madelena, on banks, Dec. 9, 1859, Wright 1675 ex p. (G, holotype; GH, GOET, NY, W, IsOTYPes); Sierra Maestra, Loma del Gato, Clemente 597 (NY), 2065 (MICH).

11b. Phyllanthus tenuicaulis var. haitiensis Webster, Contr. Gray Herb. 176: 48. 1955.

Deciduous branchlets usually $3-5 \mathrm{~cm}$. long, with $13-20$ leaves; leaves elliptic or broadly obovate, or nearly orbicular, 4-8 mm. long, 2.5-4 mm. broad; calyx-lobes of male flower c. 0.9 mm . long; pedicel of female flower c. 2 mm . long.

Type: Haiti, Ekman H4417.
Distribution: endemic to northern Haiti (Map IV).
HAITI. Nord-Ouest: Massif du Nord, Anse-à-Foleur, Morne Cheneau, highest part of ridge, c. 800 m . alt., 25 June 1925, Ekman H4417 (S, ноцотчpe); Riv. Côte de Fer, vicinity of Jean Rabel, in crevice of rock, E. C. \& G. M. Leonard 12630 (US).

The specimen of the Leonards is referred to this variety and indeed to the species with some doubt. The ovary appears not to be scabridulous, and judging from the calyx-lobes, the plant resembles $P$. lindenianus var. leonardorum. At the present time it is impossible to tell whether the variability present in the five known collections of $P$. tenuicaulis is due to hybridization or to other factors.

Among the species of sect. Cyclanthera, P. tenuicaulis is of especial interest because it undoubtedly is the species most closely related to sect. Callitrichoides; the small scabridulous capsule common to both P. tenuicaulis and $P$. carnosulus appears to be an unmistakable mark of affinity. On the other hand, however, the androecium of $P$. tenuicaulis is quite typical for sect. Cyclanthera, and the species shows several points of resemblance to some of the varieties of $P$. lindenianus.

## 12. Phyllanthus lindenianus Baill. Adansonia 2:13. 1861.

Phyllanthus cyclanthera sensu Mueller in DC. Prodr. 15 (2): 408. 1866.
Variable annual or perennial herb, sometimes suffruticose, $0.5-7 \mathrm{dm}$. high, with a single main stem or with several stems clustered at the base; stems terete, smooth or scabridulous, olivaceous and more or less purplish-
tinged, internodes mostly $8-20 \mathrm{~mm}$. long. Leaves of stems and permanent branches reduced to cataphylls: stipules triangular or lanceolate, usually acuminate, truncate at the base, entire, thin and scarious, purple or purplish brown, $0.4-1 \mathrm{~mm}$. long, $0.2-0.5 \mathrm{~mm}$. broad; blade narrower, acuminate, $0.5-1 \mathrm{~mm}$. long, $0.1-0.2 \mathrm{~mm}$. broad. Permanent branches often developed. Deciduous branchlets simple or often producing an iterative axis from the first node, (2-) $4-10 \mathrm{~cm}$. long, $0.2-0.4(-0.7) \mathrm{mm}$. thick, stramineous or greenish and usually purplish-tinged, smooth or scabridulous, terete or angled, with (5-) 10-30 nodes; first internode mostly 5-15 mm . long, median internodes c. $2-6 \mathrm{~mm}$. long. Leaves: stipules triangular to lanceolate, $0.3-1 \mathrm{~mm}$. long, $0.15-0.5 \mathrm{~mm}$. broad, acuminate, truncate at the base, entire, purplish-flecked with a whitish scarious margin. Petioles $0.3-0.7 \mathrm{~mm}$. long. Leaf-blades membranous, elliptic to obovate or sometimes suborbicular, mostly $5-15 \mathrm{~mm}$. long and $2-10 \mathrm{~mm}$. broad, acute or obtuse and apiculate at the tip, acute or obtuse and sometimes inequilateral at the base, sometimes somewhat falcate in outline; above light or dark green, often purplish-stained, smooth or sometimes scabridulous, the nerves inconspicuous; beneath pallid, often purplish-speckled, smooth or scabridulous, the midrib raised and prominent, the laterals (c. 4-6 on a side) straight, anastomosing intramarginally, obscure or purplish and conspicuous; margins smooth, plane.

Deciduous branchlets mostly floriferous; flowers solitary, the male either proximal or distal to the female (male flowers fugacious and branchlets sometimes thus appearing entirely female).

Male flower: pedicel c. $1-5(-6) \mathrm{mm}$. long. Calyx-lobes 5 (rarely 6), equal or unequal, ovate to elliptic or sometimes obovate, $0.5-1.5$ ( -1.7 ) mm . long, $0.4-1(-1.4) \mathrm{mm}$. broad, obtuse or acute, entire, usually greenish white densely flecked or stained with purple, the purplish midrib unbranched. Disk-segments 5 (6), cuneate, subentire, small and inconspicuous, scarcely if at all protruding from beneath the synandrium. Synandrium subsessile, c. $0.5-0.8(-0.9) \mathrm{mm}$. across, c. 0.15 mm . high; connective $0.25-0.5(-0.75) \mathrm{mm}$. in diameter, concave or plane, often with a central rounded knob c. 0.1 mm . across; pollen grains c. 17.5-21 $\mu$ in diameter.

Female flower: pedicel 1.5-4 (-5) mm. long, greenish or more often purplish, smooth or scabridulous, terete, gradually broadening upwards. Calyx-lobes 6 (rarely 5), ovate (in flower) becoming elliptic to obovate (in fruit), $0.9-2 \mathrm{~mm}$. long, $0.4-1.3 \mathrm{~mm}$. broad, obtuse or rounded to acute, more or less purplish-stained, the midrib unbranched. Disk irregularly cut into (5-) 7-9 cuneate, thin, purple-flecked segments, these sometimes more or less connate. Ovary smooth; styles free, ascending or horizontally spreading, rather thick and fleshy, purple-flecked, 0.2-0.4 mm . long, $1 / 3$ - to $2 / 3$-parted, the branches divergent, the narrowed obtuse tips recurved.

Capsule obtusely trigonous, smooth, $2-26 \mathrm{~mm}$. in diameter, stramineous, the nerves not apparent. Seeds when mature $0.9-1.4 \mathrm{~mm}$. long, $0.7-1$
$(-1.2) \mathrm{mm}$. radially and tangentially, dark greyish brown, with fine slightly raised closely arranged dark points in longitudinal rows; hilum triangular, brownish, c. 0.2 mm . across.

As pointed out earlier (Contr. Gray Herb. 176: 48-50. 1955), this widespread and variable species must take the name Phyllanthus lindenianus, since the earlier $P$. cyclanthera Baill. is a nomen confusum incapable of typification. At the time of that nomenclatural discussion, three distinct species were recognized within the $P$. lindenianus complex, but since then further study (including the examination of additional material) has led to a reevaluation. It has become apparent that the relative amount of scabridulousness on various organs is not as valuable a diagnostic character as had been thought. A comparison of Map VI, which shows the specimens of $P$. lindenianus distributed by variety, with Map V, in which the same specimens are scored as to scabridulousness and habit, shows that the variation pattern in these characters is not perfectly correlated with the recognized subspecific taxa. The fluctuation of characters appears so extensive, in fact, that one might think the recognition of varieties within this species is an artificial procedure which cuts across natural, random patterns of variation. However, although the available specimens constitute an admittedly incomplete sampling of the populations, the present classification seems justified for at least two reasons. In the first place, with the exception of var. lindenianus and var. inaequifolius, the varieties are allopatric, with well-defined ranges. Furthermore, the various populations include representatives with such divergent features - as the suffruticose habit of var. inaequifolius or the seed size of var. leonardorum - that it would be definitely misleading to obscure this geographically localized diversity by recognizing no subspecific entities.

A previously neglected feature which appears to be of some importance is the spatial relationship of the sexes. In var. lindenianus the male flowers are at the proximal nodes of the branchlet and the female flowers are distal, while in the other varieties this is reversed, the female being proximal to the male. This inflorescence character has been used with some misgiving, since it is very difficult to determine the disposition of the sexes in many specimens and since further study may perhaps demonstrate more variation in this respect than there now appears to be. A careful inspection of the relative positions of the male and female flowers is commended to those who may have occasion to encounter this species in the field.

## KEY TO THE VARIETIES

1. Seeds $0.9-1 \mathrm{~mm}$. long; female calyx-lobes acute; slender annual with smooth stems but scabridulous female pedicel; iterative axes typically lacking; northern Haiti
2. Seeds $1.2-1.4 \mathrm{~mm}$. long; female calyx-lobes obtuse
or rounded; at least some branchlets on every plant with iterative axes.
3. Male flowers proximal and female distal on the main or iterative axis of branchlet; stem, and usually the female pedicel, scabridulous; stems usually unbranched at base; Cuba, southern Hispaniola
var. lindenianus (12a)
4. Male flowers distal and female proximal ; stem, and usually the female pedicel, smooth.
5. Perennial, with several stems clustered at the base; leaves of upper branchlets often conspicuously smaller than those below; southern Hispaniola
var. inaequifolius (12d)
6. Annual, with a single unbranched main stem; leaves all approximately the same size; central Hispaniola
var. jimenezii (12b)

## 12a. Phyllanthus lindenianus var. lindenianus

(PLATE XVIII, fig. $A$ ).
Phyllanthus lindenianus Baill. Adansonia 2: 13. 1861.
Phyllanthus gracilissimus Baill. op. cit. 14.
Phyllanthus cyclanthera $\beta$ scabrellus Muell. Arg. Linnaea 32: 44. 1863.
Phyllanthus cyclanthera $\gamma$ gracillimus Muell. Arg. ibid.
Phyllanthus cyclanthera a lindenianus (Baill.) Muell. Arg. in DC. Prodr. 15(2): 408. 1866.

Annual, or possibly sometimes perennial, but with a single main stem unbranched at base; stem 1-4 dm. high, 1.5-3 mm. thick, stramineous to purplish and rather sparsely scabridulous or almost whitish due to densely compacted papillae. Cataphylls: stipules $0.7-1 \mathrm{~mm}$. long, $0.3-0.5$ mm . broad; blade $0.5-1 \mathrm{~mm}$. long. Deciduous branchlets usually with an iterative axis from the first node; main axis (4-) 5-8 ( -10 ) cm . long, greenish or purplish, sparsely to densely papillate or scabridulous, with mostly $10-20$ nodes. Leaves: stipules $0.5-0.8(-1) \mathrm{mm}$. long, $0.2-0.5$ mm . broad; blades mostly $5-15 \mathrm{~mm}$. long, $2-10 \mathrm{~mm}$. broad, elliptic to obovate, above smooth or conspicuously scabridulous, beneath nearly smooth to conspicuously scabridulous. Branchlets typically with proximal male flowers and 1-6 distal female flowers on both main and iterative axes, or sometimes remaining entirely male. Male flower: pedicel 1.5-3.5 $(-6) \mathrm{mm}$. long; calyx-lobes elliptic to obovate or less commonly ovate, $0.8-1.5(-1.7) \mathrm{mm}$. long, (0.6-) $0.7-1(-1.4) \mathrm{mm}$. broad; synandrium $0.5-0.8(-0.9) \mathrm{mm}$. across; connective purple-flecked, 0.3-0.6 (-0.75) mm . in diameter. Female flower: pedicel 1.7-3.5 ( -5 ) mm. long, purplish at least above, scabridulous (rarely almost smooth); calyx-lobes elliptic to obovate, mostly $1.5-2 \mathrm{~mm}$. long, ( $0.7-$ ) $0.9-1.3 \mathrm{~mm}$. broad, obtuse or rounded at the tip; styles $0.35-0.4 \mathrm{~mm}$. long. Capsule c. 2.5-2.6 mm . in diameter; seeds $1.2-1.4 \mathrm{~mm}$. long, c. 1 mm . radially and tangentially.

Type: Cuba, Monte Libano, Linden 1827 ex p.
Distribution: Cuba and western Hispaniola (Map VI).
CUBA. Pinar del Rio: Sierra de las Animas, 15 Mar. 1920, Ekman 10508 (S). Oriente: Monte Libano, May 1844, Linden 1827 ex p. (P, holotype; G, Isotype); Loma de Jagüey, alt. 600 m ., among rocks, Mar. 1889, Eggers 4928 (P, SV); Monte Verde, on rocks in dense woods, 7 July 1859, Wright 1935 (G, GH, GOET, MO, W).

HAITI. Sud: Massif de la Hotte, central group, St.-Louis du Sud, BonnetCarre, limestone, c. 1150 m., 2 Nov. 1927, Ekman H9229 (S).

DOMINICAN REPUBLIC. Barahona: Nochebuena Berge, alt. 1200 m., Sept. 1910, Fuertes 345 (C, F, G, GH, MO, P, S, US) ; Las Filipinas, 1200 m. alt., Apr. 1912, Fuertes 1470 (C, F, G, GH, P, S, US).

The somewhat aberrant form described as P. gracilissimus is represented by the following two specimens:

CubA. Oriente: Monte Liban, Linden 1827 ex p. (P, holotype of $P$. gracilissimus) ; "entree des cavernes du Mt. Liban", Linden 1827 ex p. (BR, ISOTYPE).

Baillon published $P$. lindenianus and $P$. gracilissimus at the same time, basing the two species on different plants from the same collection. Although Baillon considered the two species as very distinct, one must agree with Mueller (DC. Prodr. 15[2]: 408. 1866) that neither Baillon's descriptions nor the specimens furnish any convincing distinguishing characters. The type specimen of $P$. gracilissimus is indeed peculiar in several points: the flowers are small, the sharply acute male calyx-lobes are merely purple-striped down the center instead of being diffusely purplishtinged, the disk of the female flower is 3-lobed, and the plant has a slenderer more fragile aspect which well justifies Baillon's specific epithet. In gross appearance the plant bears a striking resemblance to var. leonardorum, but it does not agree in technical characters; on the other hand, in its habit and male flowers the type specimen of $P$. gracilissimus is almost exactly intermediate between var. lindenianus and $P$. tenuicaulis. Serious consideration must therefore be given to the possibility that it represents a hybrid between $P$. lindenianus and $P$. tenuicaulis, especially since intermediates between $P$. lindenianus var. leonardorum and $P$. tenuicaulis have been collected in northern Haiti. However, thus far P. tenuicaulis has not been found in the Monte Libano region in Oriente, the two known localities both being in the Sierra Maestra. The exact status of the plant referred to $P$. gracilissimus by Baillon must therefore remain in doubt.

Even if $P$. gracilissimus is excluded from consideration, var. lindenianus remains a polymorphic entity which is rather difficult to delimit. The Cuban plants, which have a tendency to greater scabridulousness (particularly on the leaves), evidently belong together; but some of the specimens from Hispaniola, where the range of the variety overlaps that of
var. inaequifolius, are somewhat discordant. Ekman H9229 from the Massif de la Hotte appears to be perennial like var. inaequifolius and has unusually large synandria up to 0.9 mm . in diameter, but because of its uniform leaves and scabridulous stems must be classified with the present variety.

## 12b. Phyllanthus lindenianus var. jimenezii, var. nov. ${ }^{16}$

Herb with a single main stem, apparently annual, decumbent at the base but erect above, up to 8 dm . high (ex coll.) ; stems smooth, purplishtinged. Cataphylls: stipules c. $0.6-0.7 \mathrm{~mm}$. long, blade about as long. Deciduous branchlets either with or without an iterative axis from the first node; main axis $6-10 \mathrm{~cm}$. long, purplish, smooth, with c. $15-30$ leaves. Leaves: stipules $0.8-1 \mathrm{~mm}$. long, c. $0.3-0.4 \mathrm{~mm}$. broad; blades broadly elliptic, mostly $6-10 \mathrm{~mm}$. long, 3 -5.5 mm . broad, obtuse or rounded and apiculate at the tip, smooth on both sides. Branchlets with proximal female and distal male flowers, whether or not main axis is branched. Male flower: pedicel c. 1.5 mm . long; calyx-lobes ovate to elliptic, $0.8-0.9$ mm . long, $0.6-0.75 \mathrm{~mm}$. broad, obtuse or subacute; synandrium c. 0.75 mm . across, connective c. 0.5 mm . in diameter. Female flower: pedicel becoming $4-5 \mathrm{~mm}$. long, purplish, smooth or obscurely roughened; calyxlobes oblong-ovate to elliptic, $1.2-1.5 \mathrm{~mm}$. long, $0.7-0.9 \mathrm{~mm}$. broad, obtuse or rounded at the tip; styles c. 0.35 mm . long. Mature capsule not seen entire; seeds c. 1.4 mm . long, 1.2 mm . radially and tangentially.

DOMINICAN REPUBLIC: Constanza, El Salto de Constanza, alt. 1200 m., 15 July 1955, Jiménez 2972 (US 2114149, hоlotype).

Distribution: known only from the type (Map VI).
This variety is still poorly known, and the description may have to be modified when additional material becomes available. In general aspect var. jimenezii approaches more closely to var. lindenianus than to either of the other varieties, but it differs sharply in its completely smooth parts and apparently in its inflorescence. The fact that the Jimenez specimen represents a geographically isolated population which cannot be accommodated within any of the three previously known varieties makes it seem advisable to designate it as the type of a new variety. However, since var. jimenezii combines some of the features of var. inaequifolius and var. lindenianus, its discovery has not only been influential in the decision not to recognize those two taxa as independent species, but has also raised the possibility that the present four varieties of $P$. lindenianus may be merely arbitrary concepts which mask a complex and random pattern of variation. Although this seems unlikely, only future collecting can settle the question.

[^2]12c. Phyllanthus lindenianus var. leonardorum (Webster), stat. nov.
Phyllanthus leonardorum Webster, Contr. Gray Herb. 176: 50. 1955.
Slender erect annual; stem unbranched except above, 0.5-2.5 dm. high, $0.4-1.3 \mathrm{~mm}$. thick, usually pale stramineous-whitish or greenish below, purplish and more or less pruinose above, smooth or very obscurely and remotely scabridulous. Cataphylls: stipules $0.4-0.8 \mathrm{~mm}$. long, $0.15-0.25$ mm . broad; blade $0.5-0.7 \mathrm{~mm}$. long, $0.1-0.2 \mathrm{~mm}$. broad. Deciduous branchlets with a female flower at the first node or less commonly producing an iterative axis there, (2-) $4-6(-7) \mathrm{cm}$. long, purplish, smooth, with $5-25$ leaves. Leaves: stipules $0.3-0.6 \mathrm{~mm}$. long, $0.2-0.3 \mathrm{~mm}$. broad, blades obovate or elliptic, (2-) 4-9 mm. long, (1.5-) $2-5 \mathrm{~mm}$. broad, smooth on both sides. Branchlets very often with a female flower at the first node, the succeeding two nodes typically bearing male flowers; this arrangement repeated with more or less regularity the entire length. Male flower: pedicel $0.75-2 \mathrm{~mm}$. long; calyx-lobes usually ovate-triangular and sharply acute (sometimes obovate and obtuse), $0.5-0.8 \mathrm{~mm}$. long, $0.4-0.8$ mm . broad; synandrium $0.45-0.5 \mathrm{~mm}$. across, connective $0.25-0.3 \mathrm{~mm}$. in diameter, yellowish white. Female flower: pedicel $1.6-3.5 \mathrm{~mm}$. long, greenish or purplish, scabridulous; calyx-lobes ovate in flower, tending to become obovate in fruit, $1-1.4 \mathrm{~mm}$. long, $0.3-0.6 \mathrm{~mm}$. broad, narrowed to an acute tip; styles $0.2-0.35 \mathrm{~mm}$. long. Capsule c. $2-2.2 \mathrm{~mm}$. in diameter; seeds c. $0.9-1.1 \mathrm{~mm}$. long, $0.7-0.9 \mathrm{~mm}$. broad.

Type: Haiti, E.C. © G. M. Leonard 12624.
Distribution: dry calcareous areas, central and northern Haiti (Map VI).

HAITI. Nord-Ouest: Presqu'ile du Nord-Ouest, Port-de-Paix, cultivated place in Prosopis thickets south of Saline-Michel, 12 Apr. 1925, Ekman H3756 (S) ; west of Saline-Michel, 15 Mar. 1928, Ekman H9702 (S); vicinity of Jean Rabel, Môle Road, 27 Jan. to 9 Feb. 1929, E. C. \& G. M. Leonard 12624 (GH, holotype; MICH, MO, NY, US, isotypes). Artibonite: Massif des Matheux, l'Archaie, Trou-Forban, in Bayahonde thickets, 10 Oct. 1926, Ekman H7092 (S, US).

Variety leonardorum is perhaps the most xerophytic population of $P$. lindenianus; and it is so well characterized by its depauperate habit, small fruit and seeds, and usually unramified branchlets, that it was originally described as a distinct species. However, further analysis of the variation within the $P$. lindenianus complex has led to the conclusion that it is preferable to regard $P$. leonardorum as a geographically and ecologically isolated variety of the inclusive species $P$. lindenianus.

In aspect var. leonardorum strongly resembles $P$. tenuicaulis, which also occurs in northern Haiti; the latter, however, may be easily distinguished by its lack of purplish coloration. It is difficult to decide whether the resemblance between the two taxa is due to close affinity (var. leonardorum possibly representing the group through which P. lindenianus evolved from $P$. tenuicaulis), or to hybridization between them, or to both of these
factors. An intermediate specimen possibly of hybrid origin (Leonard \& Leonard 12630) has already been discussed under P. tenuicaulis.

The Ekman collection from the Massif de Matheux differs from the other collections of var. leonardorum in aspect, blunter lobes of the male calyx, and shorter fruiting pedicels. However, until other collections are available from the area it is impossible to tell whether it represents anything more than a local variant.

## 12d. Phyllanthus lindenianus var. inaequifolius (Webster), stat. nov. <br> (PLATE XVII, figs. $A-C$; PLATE XVIII, fig. B).

Phyllanthus inaequifolius Webster, Contr. Gray Herb. 176: 48. 1955.
Suffruticose perennial 3-7 dm. high with few to several main stems diverging from the base; stems subsimple above, smooth, brownish below, above olivaceous and more or less purplish-tinged. Cataphylls: stipules $0.7-1 \mathrm{~mm}$. long, mostly $0.3-0.4 \mathrm{~mm}$. broad; blade $0.7-1 \mathrm{~mm}$. long, c. $0.15-0.2 \mathrm{~mm}$. broad, commonly adnate to the stipules in the lower half. Deciduous branchlets, at least those above, usually with an iterative axis from the first node; main axis $5-10 \mathrm{~cm}$. long, green or purplish, smooth, with mostly 15-30 leaves; leaves of lower branchlets usually conspicuously larger than those of the upper branchlets, the transition more or less abrupt, or sometimes leaves not noticeably unequal. Leaves: stipules $0.7-1 \mathrm{~mm}$. long, c. 0.3 mm . broad; blades membranous to chartaceous, elliptic to obovate, usually obtuse and apiculate at the tip, smooth on both sides, the smaller c. $2-5 \mathrm{~mm}$. long and $1-2.5 \mathrm{~mm}$. broad, the larger c. $5-15 \mathrm{~mm}$. long and $3-8 \mathrm{~mm}$. broad. Branchlets ordinarily not producing female flowers on the main axis (unless it is unramified), but often with distal male flowers; iterative axis with (1-) 3 proximal female flowers, succeeded distally by several males. Male flower: pedicel 1.7-3.7 mm . long; calyx-lobes mostly ovate, $0.7-1(-1.2) \mathrm{mm}$. long, $0.5-0.9 \mathrm{~mm}$. broad, acute or subacute; synandrium $0.5-0.75 \mathrm{~mm}$. across, connective $0.3-0.5 \mathrm{~mm}$. in diameter. Female flower: pedicel $1.7-4 \mathrm{~mm}$. long, purplish, smooth; calyx-lobes ovate to obovate, $0.9-1.3 \mathrm{~mm}$. long, $0.6-0.9 \mathrm{~mm}$. broad, obtuse at the tip; styles $0.35-0.4 \mathrm{~mm}$. long. Capsule c. 2.2-2.3 mm . in diameter; seeds $1.2-1.4 \mathrm{~mm}$. long, $1-1.1 \mathrm{~mm}$. radially and tangentially.

Type: Haiti, Ekman H1344.
Distribution: limestone areas, southern Haiti (Map VI).
HAITI. Sud: slopes of limestone hills near Randelle, at roadside, not far from Port-à-Piment, 12 Aug. 1917, Ekman H674 (S). Ouest: Massif de la Selle, Morne Brouet, on dry ridges, alt. 1700 m., 6 Aug. 1924, Ekman H1344 (S, holotype; US, Isotype) ; Mornes des Commissaires, in open pine forest, alt. 1600 m., 17 Oct. 1941, Holdridge 859 (MICH, NY, US); vicinity of Mission, Fonds Varettes, alt. 1000 m . and above, 17 Apr. to 4 May 1920, Leonard 3985 (NY, US); vicinity of Furcy, Morne de Wegan, cliff, alt. c.

1300 m., Leonard 4600 (US); Mornes des Commissaires, on mossy limestone boulders, alt. 5560 ft ., 17 Sept. 1955, Proctor 10865 (A).

The plant of the type collection, Ekman H1344, has such a distinctive aspect due to its perennial habit with the leaves abruptly smaller above that it was originally described as a species distinct from $P$. lindenianus. However, the examination of additional material has shown that only the two Ekman collections have a marked difference in leaf size; furthermore, the population typified by Ekman H1344 agrees in essential details of leaf, flower, and seed with typical P. lindenianus. As Map V demonstrates, the scabridulous character of stem, female pedicel, and calyx is too fluctuating to serve for the delimitation of distinct species. The difference in disposition of the sexes may prove to hold even when more material becomes available, but even so it does not appear to outweigh the many apparent similarities. Consequently, the preferable course is to recognize this population of southern Haiti as a variety of the widespread $P$. lindenianus.

A difficulty raised by the adoption of the present concept is that at least one collection of var. lindenianus (Ekman H9229) lies within the known range of var. inaequifolius. If further collecting should make it apparent that the two entities occur sympatrically over much of southern Haiti without intergradation, the possibility of specific status for var. inaequifolius might have to be re-examined. However, Ekman H9229 is itself such an aberrant representative of var. lindenianus that it can hardly be taken as evidence for the sympatric distribution of the two varieties.
13. Phyllanthus abditus Webster, Contr. Gray Herb. 176: 50. 1955.
(PLATE XVII, figs. $D-E$; PLATE XVIII, fig. C).
Suffruticose perennial c. 4 dm . high with several erect stems clustered on a caudex; stems terete, smooth, greenish, somewhat zigzag above, c. 1.5 mm . thick; internodes c. $10-25 \mathrm{~mm}$. long. Leaves of main stems reduced to cataphylls: stipules lanceolate, c. 1 mm . long, $0.3-0.4 \mathrm{~mm}$. broad, acuminate, purplish-flecked, entire; blade narrower, more or less adnate to the stipules in the lower half. Deciduous branchlets simple below but upper ones producing an iterative axis from the first node; main axis 6-9 cm . long, $0.2-0.4 \mathrm{~mm}$. thick, green, smooth, terete or somewhat angled below, with c. 25-35 leaves; first internode $5-7 \mathrm{~mm}$. long, median internodes $2-6 \mathrm{~mm}$. long. Leaves: stipules lanceolate, $0.8-0.9 \mathrm{~mm}$. long, $0.2-0.3$ mm . broad, acuminate, purplish. Petioles $0.5-0.75 \mathrm{~mm}$. long. Leaf-blades membranous, elliptic or obovate, c. $5-12 \mathrm{~mm}$. long, $3-6 \mathrm{~mm}$. broad, broadly obtuse or rounded and apiculate at the tip, cuneate or obtuse at the base, smooth on both sides; above bright green, the nerves (except the midrib) obscure; beneath pallid, the laterals forming a delicate reticulum; margins smooth, unthickened.

Deciduous branchlets never with a female flower at the first node (an iterative axis produced instead), the female flowers 1 (or sometimes 2?)
per branchlet, produced on the proximal part of either the main or iterative axis, the several male flowers distal.

Male flower: pedicel $1.4-1.8 \mathrm{~mm}$. long. Calyx $1.7-1.8 \mathrm{~mm}$. long; calyx-lobes 5, purple-flecked, 1-nerved, fused in the lower third into a turbinate cup c. $0.6-0.7 \mathrm{~mm}$. high which is constricted at the juncture with the lobes; free portion of lobes broadly ovate or suborbicular, $1-1.2$ mm . long, $0.8-1.2 \mathrm{~mm}$. broad, obtuse or rounded, purple-flecked, the midrib unbranched, entire with an extremely narrow thickened margin. Disksegments 5 , suborbicular, fleshy, rather thick, whitish, concealed in the


Map VII. Distribution of Phyllanthus abditus Webster (starred circle) and Phyllanthus berteroanus Muell. Arg. (solid circles).
calycine cup at the base of the synandrial column. Synandrium on a column c. 0.7 mm . high, c. $0.15-0.2 \mathrm{~mm}$. thick, tapering slightly upwards, lightly purplish-tinged; synandrium circular or elliptic in outline, c. 0.70.8 mm . across; connective c. $0.45-0.5 \mathrm{~mm}$. in diameter, purplish-flecked, with a conspicuous central knob; pollen grains c. 17-21 $\mu$ in diameter.

Female flower: pedicel $3.3-3.7 \mathrm{~mm}$. long, purplish, smooth, tapering upwards from the slender lower half. Calyx-lobes 6 , separate essentially to the base, obovate, $1.4-1.6 \mathrm{~mm}$. long, $0.75-0.9 \mathrm{~mm}$. broad, rounded at the tip, entire, purplish-flecked or nearly immaculate, midrib unbranched. Disk divided as in $P$. lindenianus into c. 7 or 8 thin, cuneate segments up to 0.2 mm . long. Ovary smooth; styles united at the base into a short but definite column $0.15-0.2 \mathrm{~mm}$. high, steeply and divergently ascending, $0.5-0.6 \mathrm{~mm}$. long, $2 / 5$-parted to bifid, slender, the branches diverging, the acute tips recurved.

Capsules not seen entire; valves olivaceous, nerveless. Seeds c. 1.25 mm . long, 1 mm . radially and tangentially, dark brown, with longitudinal rows of dark raised points; hilum triangular, c. 0.25 mm . across.

Type: Haiti, Dépt. Sud, Massif de la Hotte, western group, Camp Perrin, northern slope of Morne Vandervelde, on rocks at Source Mare Blanche, c. 700 m., 30 Nov. 1925, Ekman H5197 (S, holotype; associated on the sheet with Lygodium volubile Sw.).

Distribution: known only from the type collection (Map VII).
This restrictedly endemic species resembles $P$. lindenianus var, inaequifolius in a number of ways, and perhaps is most closely related to it. Vegetatively the present species could hardly be distinguished from forms of $P$. lindenianus, but the floral characters are so distinctive that Ekman $H 5917$ surely must represent a distinct species rather than a mere aberrant state of $P$. lindenianus. However, there is little doubt that $P$. abditus is closely related to that species and does not stand as isolated in the section as does $P$. berteroanus.
14. Phyllanthus berteroanus Muell. Arg. Linnaea 32: 44. 1863: DC. Prodr. 15(2): 408. 1866.
(PLATE XVII, figs. $F-G$; PLATE XVIII, fig. $D$ ).
Diasperus berteroanus (Muell. Arg.) O. Ktze. Rev. Gen. 2: 598. 1891. Phyllanthus anisophyllus Urb. Repert. Sp. Nov. 18: 364. 1922.

Perennial herb c. 3-8 dm. high, with one to several terete erect stems from a woody base; all parts completely smooth and glabrous. Lowermost c. 15-20 nodes on main stems bearing large leaves and no branchlets, the subsequent leaves (subtending branchlets) on the main stem and those on the branchlets more or less abruptly reduced in size. Leaves of main axis, though reduced above, mostly not completely scale-like: stipules lanceolate, c. (0.7-) $1.2-2 \mathrm{~mm}$. long, $0.4-0.8 \mathrm{~mm}$. broad, acuminate, entire, olivaceous or brownish, scarious. Petioles of lower leaves up to 2 mm . long, those of uppermost leaves less than 1 mm . long. Larger blades (those not subtending branchlets) oblanceolate, obcuneate, oblong, or elliptic, usually coriaceous (more rarely membranaceous), $15-75 \mathrm{~mm}$. long. Deciduous branchlets invariably unbranched, mostly $5-10 \mathrm{~cm}$. long, sometimes (particularly those from lower nodes) up to 20 cm . long or at the apex reduced to c. 2.5 cm . long, $0.3-0.6(-0.9) \mathrm{mm}$. thick, olivaceous, subterete, with 10-25 (-40) leaves; first internode mostly $5-12 \mathrm{~mm}$. long (up to 20 mm . on lower branchlets), median internodes $2-8 \mathrm{~mm}$. long. Leaves: stipules lanceolate, $0.7-1.2(-1.5) \mathrm{mm}$. long, $0.25-0.4(-0.5) \mathrm{mm}$. broad, acuminate, olivaceous with yellowish entire margins, the tip more or less scarious. Petioles of smaller leaves c. $0.4-1 \mathrm{~mm}$. long, of larger leaves $1-1.5$ $(-2) \mathrm{mm}$. long. Leaf-blades coriaceous to membranous, mostly elliptic or oblong, sometimes slightly falcate, 3-15 (-20) mm. long, 2-8 (-11) mm. broad (those of the upper branchlets often strikingly smaller than those of the lower), obtuse to acute with a conspicuous scarious-indurate apiculum, obtuse at the base; above olivaceous, sublucid, the midrib plane or very slightly raised, the laterals usually obscure; beneath yellowish green or rarely whitened, the midrib conspicuously raised, the laterals (c. 4 or 5 on a side) and the fine reticulum of tertiaries subprominent to obscure; margins plane or reflexed, not revolute.

Monoecious; female flowers 1-3 ( -4 ) at the distal nodes of the branchlet, male flowers at the proximal nodes (first node sometimes barren):
both sexes borne on the same or sometimes perhaps on different branchlets.

Male flower: pedicel 4-7 mm. long. Calyx-lobes 6, biseriate, subequal. ovate or triangular, ( $0.9-$ ) $1-1.4 \mathrm{~mm}$. long, ( $0.8-$ ) $1-1.7 \mathrm{~mm}$. broad. obtuse or acute, entire, yellowish or greenish white and often purplishtinged at base, midrib pinnately branched. Disk-segments 6, obovate to squarish in outline, distal portion fleshy, purplish, petaloid, $0.4-0.65 \mathrm{~mm}$. long, $0.5-0.9 \mathrm{~mm}$. broad. Stamens 3; synandrium subsessile, ( $0.5-$ ) $0.7-0.9(-1) \mathrm{mm}$. across, round or trigonous in outline; connective more or less plane, purplish, ( $0.4-$ ) $0.5-0.8 \mathrm{~mm}$. in diameter; pollen grains c. 26-27 $\mu$ in diameter.

Female flower: pedicel (5-) 6-10 (-12) mm. long, olivaceous or stramineous, terete below, becoming angled and gradually thickened above. Calyx-lobes 6, biseriate, subequal, ovate to suborbicular, (1.5-) 1.72.3 mm . long and about as broad, blunt to subacute at the tip, entire, olivaceous, midrib pinnately branched; lobes spreading or reflexed in fruit. Disk-segments 6 , obcuneate or obovate, purplish and petaloid as in the male, persistent with the fruiting calyx. Ovary smooth, depressed at anthesis, the horizontal styles nearly touching the disk; styles free, $0.4-$ 0.5 mm . long, bifid, the branches divergent, the slender tips recurved.

Capsule oblate, rounded-trigonous, c. $3.7-4.2 \mathrm{~mm}$. in diameter, smooth, stramineous, the veins completely obscure. Columella c. $1.3-1.5 \mathrm{~mm}$. long. Seeds trigonous, (1.8-) 1.9-2.3 mm. long, (1.4-) $1.5-1.8(-2) \mathrm{mm}$. radially, (1.4-) $1.5-2 \mathrm{~mm}$. tangentially, dark brown to almost black, colliculose with slightly raised transversely elongated dots; hilum roundish. c. $0.3-0.4 \mathrm{~mm}$. in diameter.

Type: "St. Domingue," Bertero (G, holotype; P, isotype). The exact locality of Bertero's collection is not known.

Distribution: calcareous areas, northern Hispaniola (Map VII).
HAITI. Nord-Ouest: vicinity of Jean Rabel, rocky slope of mountain south of town, 4 Mar. 1929, E. C. \& G. M. Leonard 13709 (US); Massif du Nord, Port-de-Paix, Morne Fourris, deep limestone cliffs, alt. c. 400 m., 30 Apr. 1925, Ekman H3960 (S, US). Artibonite: vicinity of St. Michel de l'Atalaye, alt. c. 350 m., cultivated slope, Habitation Baille, 26 Nov. 1925, Leonard 7477 (US) ; vicinity of Marmelade, alt. c. 800 m., dry bank, road to St. Michel, 21 Dec. 1925, Leonard 8421 (US); Camp No. 4, Marmelade, pineland, alt. c. 2950-3050 ft., 1 \& 2 Aug. 1905, Nash \& Taylor 1265, 1276 (NY); Ennery, in thickets on soft limestone, c. 400 m., 14 Nov. 1924, Ekman H2449 (S, US) ; Massif du Nord, Hinche, Morne Pedregal, Oligocene limestone, 600 m. , 13 May 1926, Ekman H6093 (S) ; vicinity of Ennery, alt. 325-900 m., dry bank, Puilboreau road, 13 Jan. 1926, Leonard 8826 (NY, US); vicinity of Ennery, alt. 325-900 m., on rocks, 19-21 Jan. 1926, Leonard 8989, 9063 (US).
dominican republic. Monte Cristi: Cordillera Central, Monción, at La Harquetta, limestone, c. 400 m., 29 May 1929, Ekman H12661 (S). Santiago: Cordillera Central, Santiago, road to Jánico, c. 350 m., Miocene limestone, hillsides, 16 Nov. 1930, Ekman H16159 (S) ; Cordillera Septentrional, Santiago, Cuesta de Piedras, rocky slope, c. 200 m., 23 Nov. 1930, Ekman H16231
(S, US) ; El Buzo, 900 m. alt., 14 Jan. 1945, Jiménez 301 (A, US). Espaillat: near Salcedo, 31 Oct. 1954, Jiménez 2763 (US). Samana: Samaná Peninsula, vicinity of Sanchez, sea level to 300 m . alt., base of limestone cliff, 29 Nov, to 12 Dec. 1920, Abbott 165, 166 (US); Samaná, Boca de Río San Juan, steep cliffs, 17 May 1930, Ekman H14998 (S).

Phyllanthus berteroanus is probably the most abundant species in sect. Cyclanthera, although in overall area of distribution it must yield first place to $P$. lindenianus. It appears to be common everywhere along the chain of mountains which roughly parallels the northern coast of Hispaniola. Morphologically P. berteroanus is the most sharply defined representative of sect. Cyclanthera; although it is somewhat similar in aspect to $P$. lindenianus var. inaequifolius, it can be only distantly related to that plant. The striking petaloid disk-segments, branching calycine midrib, and large fruit and seeds show that $P$. berteroanus occupies a very isolated position within sect. Cyclanthera. The unreduced and often coriaceous leaves on the main stem and the lack of iterative axes on the branchlets make it possible to identify this species from vegetative material alone.

As might be expected for such a wide-ranging species, there is considerable intraspecific variation in $P$. berteroanus, particularly in the size and texture of the leaves; but the variation patterns are so indefinite that it does not seem desirable to create any subspecific entities. Urban's $P$. anisophyllus, said to differ in its leaf form and disk-segments, was based on Buch 1062 from Plaisance, Haiti, and Abbott 165 from the Samaná Peninsula. The Buch collection has unfortunately not been examined, and Urban's specimen was presumably lost in the destruction of the Berlin Herbarium. However, the Abbott collection, although deviating from the norm by virtue of its larger and thinner leaves, certainly does not appear to represent a distinct species. The shape of the disk-segments varies from nearly square to obovate or obcuneate, the variation depending at least partially on the amount of lateral compression. At the present time it does not appear necessary to distinguish the Samaná Peninsula population even on the varietal level.

## Sect. 10. Urinaria Webster, Contr. Gray Herb. 176: 51. 1955.

Annual or perennial herbs with phyllanthoid branching; deciduous branchlets angled or winged, leaves hispidulous near margin, stipules conspicuously auriculate. Monoecious; female flowers solitary in the proximal

PLATE XVII. Section Cyclanthera.
Figs. A-C. Phyllanthus lindenianus var. inaequifolius (Webster) Webster. A, branchlet showing iterative axis to right (Proctor 10865 [A]) ; B, male flower (Ekman H1344 [S]); C, female flower (Ekman H1344 [S]). Figs. DE. Phyllanthus abditus Webster (Ekman H5197 [S]). A male flower with half of calyx cut away to show calyx tube and synandrial column; B, female flower. Figs. F-G. Phyllanthus berteroanus Muell. Arg. (Ekman H1659 [S]). F, male flower; G, female flower (venation shown in only one calyx-lobe). (Figs. B-G all drawn to same scale.)


Webster, West Indian Phyllanthus
axils, male in cymules in the distal axils. Male flower: calyx-lobes 6; disk-segments 6 , very small; stamens 3, filaments free or united; anthers erect, dehiscing vertically; pollen grains subglobose, 4-colporate, finely reticulate. Female flower: subsessile; calyx-lobes 6; disk a shallow cup: ovary conspicuously bullate, styles laterally fused at base. Capsule oblate, tuberculate; seeds trigonous, with sharp transverse ridges on back and sides, the lateral faces more or less deeply pitted. ${ }^{17}$

## Type species: Phyllanthus urinaria L.

This section, included in sect. Paraphyllanthus by Mueller, is actually very distinctive on the basis of its characteristic stipules, spatial arrangement of the sexes, and unique seeds. It includes, in addition to the type species, four additional species described from India, Indo-China, the Philippines, and Tahiti, respectively: P. hookeri Muell. Arg., P. arenarius Beille, P. benguetensis C. B. Rob., and P. societatis Muell. Arg. Except for the problematical $P$. croizatii Steyerm. from Venezuela (which is probably only a form of $P$. urinaria), no indigenous representatives occur in the New World.

The phylogenetic relationships of sect. Urinaria are of considerable interest, because in many respects (particularly with regard to stipules and female flower) the species of this group resemble those of sect. Loxopodum. On the other hand, in branching habit the members of sect. Urinaria accord much more closely with sect. Phyllanthus. It appears at least possible that sect. Urinaria has evolved from sect. Loxopodium quite independently of sect. Phyllanthus, which is probably descended from some group in subg. Kirganelia. If this could be confirmed it would be a clear demonstration of the independent origin of phyllanthoid branching at least twice within the genus.
15. Phyllanthus urinaria L. Sp. Pl. 982. 1753; Muell. Arg. in DC. Prodr. 15(2): 364. 1866.
(Text-fig. 9).
Urinaria Indica, supina, cauliculus rubentibus Burm. Thes. Zeyl. 231. 1737.
Phyllanthus. . . floribus sessilibus, caule herbaceo procumbente L. Fl. Zeyl. 157-158. 1747.
Phyllanthus cantoniensis Hornem. Enum. Pl. Hort. Hafn. 29. 1807.
Phyllanthus alatus Blume, Bijdr. 594. 1826.
Phyllanthus lepidocarpus Sieb. \& Zucc., Abh. Acad. Muench. 4(2): 143. 1843.
Phyllanthus leprocarpus Wight. Icon. Pl. Ind. Or. 5(2): pl. 1895. 1852.
PLATE XVIII. Section Cyclanthera.
Fig. A. Holotype specimen of P. lindenianus Baill. var. lindenianus (Linden 1827 ex p. [P]). Fig. B. Holotype specimen of P. lindenianus Baill. var. i aequifolius (Webster) Webster (Ekman H1344 [S]). Fig. C. Holotype specimen of Phyllanthus abditus Webster (Ekman H5197 [S]). Fig. D. Representative specimen of Phyllanthus berteroanus Muell. Arg., showing fully developed leaves on main axis (Leonard 9063 [GH]).
${ }^{17}$ See Plate XI, figs. 53 and 54.


Webster, West Indian Phyllanthus

Diasperus urinaria (L.) O. Ktze. Rev. Gen. 2: 601. 1891.<br>Phyllanthus chamaepeuce Ridl. Trans. Linn. Soc. Ser. II, 3: 345. 1893.

Erect or procumbent herb, normally annual; primary stem simple or becoming ramified, mostly $1.5-5 \mathrm{dm}$. high and $1-2.5 \mathrm{~mm}$. thick, smooth and olivaceous to reddish above, nearly terete but with narrow acute ridges decurrent from the nodes. Cataphylls scarious, stramineous; stipules ovate-lanceolate, attenuate-acuminate, conspicuously auriculate at the base, the auricles denticulate or lacerate, often overlapping and stipule then appearing peltate, c. $2-3 \mathrm{~mm}$. long, $0.8-1.2 \mathrm{~mm}$. broad; blade ovatelanceolate, acuminate, less conspicuously auriculate, displaced onto the base of the deciduous branchlet c. 1 mm . above the attachment of the stipules, $1.5-2.5 \mathrm{~mm}$. long. Deciduous branchlets ascending, (3-) $5-10 \mathrm{~cm}$. long, 0.5-0.7 ( -0.9 ) mm. thick, olivaceous or sometimes reddish, flattened and acutely winged, the raised median area hirsutulous, with c. 20-35 leaves; first internode (3-) 5-12 ( -15 ) mm. long, internodes between female flowers (2.5-) 3-5 (-7) mm . long, between male flowers mostly $1.5-2 \mathrm{~mm}$. long. Leaves: stipules unequal, the longer of each pair c. $0.8-1.5 \mathrm{~mm}$. long, triangular-lanceolate, attenuate-acuminate, not auriculate, entire, membra-nous-scarious, stramineous or brownish. Leaf-blades (6-) 8-20 (-25) mm. long, (2-) 2.5-6 (-9) mm. broad, membranous or somewhat firm, mostly oblong or oblong-obovate or nearly linear, sometimes slightly falcate, obtuse or acute and mucronulate at the tip, mostly obtuse and sometimes conspicuously asymmetric at the base; above bright or dark green, smooth, the raised midrib and laterals quite apparent; beneath pallid or sometimes reddish-tinged, minutely scabridulous on the face, hispidulous marginally and immediately intramarginally, midrib and the laterals (c. 5 on a side) raised and conspicuous, tertiaries forming a delicate, rather obscure reticulum.

Monoecious; well-developed branchlets nearly always floriferous; (5-) $8-15(-20)$ proximal nodes with solitary female flowers; 5-10 ( -15 ) succeeding distal nodes bearing abbreviated monochasia of 5-7 successively maturing male flowers; distalmost nodes and occasionally (here and there) some proximal nodes barren.

Male flower: Pedicel less than 0.5 mm . long, disarticulating above the middle. Calyx-lobes 6, elliptic to oblong-obovate, c. $0.3-0.45 \mathrm{~mm}$. long, $0.2-0.4 \mathrm{~mm}$. broad, obtuse, more or less entire, membranous, yellowish white, the midrib unbranched. Disk-segments 6, cuneate or roundish, c. 0.1 mm . across, obscurely glandular-papillate and crenulate. Stamens 3 , filaments completely united into a slender column c. $0.1-0.15 \mathrm{~mm}$. high; anthers sessile on the column but free from another, erect, c. $0.1-0.15 \mathrm{~mm}$. long, 0.1 mm . broad; anther-sacs parallel, dehiscing vertically, the slits not confluent; pollen grains subprolate, c. $20 \mu$ long and $16 \mu$ broad, 4 colporate, colpi with median pores, exine finely reticulate.

Female flower: Pedicel 0.5 mm . long or shorter, green or reddish, smooth, terete, becoming greatly thickened in fruit. Calyx-lobes 6, erect at anthesis, reflexing in fruit, linear-oblong or lanceolate, $0.6-0.9 \mathrm{~mm}$. long, $0.2-0.3 \mathrm{~mm}$. broad, obtuse or rounded at the tip, hispidulous dorsally
at the base and on the olivaceous or reddish slightly raised midrib area, yellowish, scarious, margins minutely serrulate or entire. Disk patelliform, thin, 6 -angled or obscurely crenulate. Ovary spheroidal, olivaceous or reddish, conspicuously bullate-papillate; styles flattened and laterally fused at the base into a horizontal triangular plate $0.35-0.4 \mathrm{~mm}$. across, c. $1 / 3$ parted, the branches divaricate and recurving at the tips.

Capsule c. 2-2.2 mm. in diameter, scurfy-tuberculate or nearly smooth, olivaceous or stramineous often with reddish blotches, nervation completely obscure. Seeds $1.1-1.2 \mathrm{~mm}$. long, ( $0.8-$ ) $0.9-1 \mathrm{~mm}$. radially, $0.9-1 \mathrm{~mm}$. tangentially, light greyish brown, with $12-15$ sharp transverse ridges on the back and sides (these discrete or sometimes coalescing in pairs), often with 1-3 deep circular pits on the sides; hilum subterminal, depressed, more or less triangular.

Flowering all year.
Type: Ceylon, Herb. Hermann (BM). There are three specimens in Hermann's herbarium, of which vol. 4, fol. 55 probably represents the holotype, as it bears an annotated reference to Burman's description in the "Thesaurus Zeylanicus."

Distribution: Native to Asia, introduced at scattered localities throughout the tropics.


Text-fig. 9. Phyllanthus urinaria L. (Webster \& Wilson 4923). A, male flower; B, female flower with two calyx-lobes removed; C, gynoecium and disk seen from above.

JAMAICA. St. Mary: Castleton grounds, 490 ft., Harris 12142 (C, F, P, S, US). St. Andrew: vicinity of Kingston, Britton 1708 (NY); Hope Grounds, 650 ft. alt., Harris 12155 (F, NY, P, S, US) ; Hope River Valley, Harris 9980 (F, US). St. Thomas: Bath, in shady places, Harris 12195 (C, F, P, US) ; Corn Puss Gap, Webster \& Wilson 4923 (A, JAM, MICH). Portland: clay bank by roadside, Seamen's Valley, Maxon \& Killip 54 (F, NY, US); vicinity of Windsor, Maxon \& Killip 264 (F, NY, US).

LESSER ANTILLES. Guadeloupe: Gourbeyre, Duss 213 (P); Pointe-àPitre, Duss 2922 (NY); champs cultivés, L. Quentin 88 (P); champs, alt. $100 \mathrm{~m} .$, R. Quentin 925 (P); Montebello, 60 m ., Questel 438, 441 (US); Baillif aux Vieux-Habitants, Stehle 71 (US); friches de cannes-à-sucres, Pointe-à-Pitre, Stehlé 238, 500 (NY); Abymes, alt. 19 m., Stehlé 1193 (NY); Ste. Rose, champs et friches lateriques, Stehlé 1829 (US); Basse Terre, 1877, Thiebaut (P). Dominica: Rouseau Valley, Lloyd 558 (NY); roadside in cleared forest land, Sylvania Estate, alt. 549 m., Hodge 575 (NY). Martinique: St. Pierre, Belanger 292 ex p. (G); Troisième pont, Hahn 554 (G, L, P), 929 (P) ; Balata, Mouret (P); champ de bananes, Ravine-Vilaine, Privault 44 ex p. (P). St. Lucla: 1889, Walsh (NY); moist forest, Velez 3312 (US). St. Vincent: Montrose Hills, 800 ft., Eggers 6561 (US). Grenada: Animas, mountains, banks in open places, Broadway ex $p$. (NY, mixed with $P$. caribaeus) ; Belvedere, 1600-1800 ft., Eggers 6111 (GOET, L, P, US); Mt. Pleasant, 1500 ft ., G. S. Miller 159 (US). Tobago: damp ground, Caledonia, Hunnewell 19935 (GH). Trinidad: Port of Spain, Wall (S); St. Ann's, Cascade, on banks, Broadway 5057 (F, G, S) ; St. Joseph, D'Ade's Estate, in open ground, Broadway 2638 (F. G. L).

None of the West Indian collections seen of this species was made prior to 1850 , so that it is evidently a comparatively recent introduction to our area. Even now, after more than a hundred years, it has not established itself on Cuba, Hispaniola, or Puerto Rico. Definitely mesophytic and one of the most shade-tolerant of the herbaceous species, it does not appear likely to become a serious weed.

Phyllanthus urinaria is obviously a foreigner in the West Indies, for it differs in many details from the superficially similar native species of sect. Phyllanthus. The transversely barred seeds and hispidulous leaves are unique in the West Indies, and the tuberculate ovary and subsessile fruiting calyces offer additional characters which should make it one of the easiest species to identify. Furthermore, $P$. urinaria is distinguished physiologically from all of its congeners in our area by the sensitive reaction of the branchlets to touch; when a plant is disturbed sufficiently, the leaves fold together in the manner of Mimosa pudica leaflets, although much more slowly.


[^0]:    ${ }^{13}$ See Plate IX, fig. 39.

[^1]:    ${ }^{14}$ See Plate XVII, fig. A.
    ${ }^{15}$ See Plate IX, fig. 40.

[^2]:    ${ }^{18}$ Phyllanthus lindenianus var. jimenezii, var. nov.
    Verisimiliter annuus, omnino laevis; foliis membranaceis, ellipticis, plusminusve inter se aequalibus, $6-10 \mathrm{~mm}$. longis; lobis calycis florum masculorum c. $0.8-0.9 \mathrm{~mm}$. longis, florum femineorum c. $1.2-1.5 \mathrm{~mm}$. longis; seminibus c. 1.4 mm . longis.

